MIDWEST CHP APPLICATION CENTER
In Partnership with the US DOE

combined heat & power at hog farms

Colorado Pork LLC
80 kW CHP Application

Project Profile

Quick Facts

Location:
Lamar, Colorado
Farm Operation:
5,600 Sow Farrow to Wean
15,000-18,000 gallons/day manure
Energy Plant Equipment:
Caterpillar Model 3306 engine
Generating Capacity:
80 kW
Thermal Heat Recovered:
2,200 MMBtu/Year (est.) hot water
Digester and Electric Generating Equipment Cost:

Total Cost:	$375,000
EPA AgStar Grant:	$ 75,000
Net Cost:	$300,000

Annual Savings:
$38,700 electricity savings
$10,000 lagoon clean-out savings
Estimated Simple Payback:
With Grant: 6.7 Years
W/O Grant: 7.5 Years
System Online:
September, 1999
Recent System Expansion:
Addition of 30 kW Capstone Microturbine

Covered Lagoon Digester at Colorado Pork LLC

Project Overview

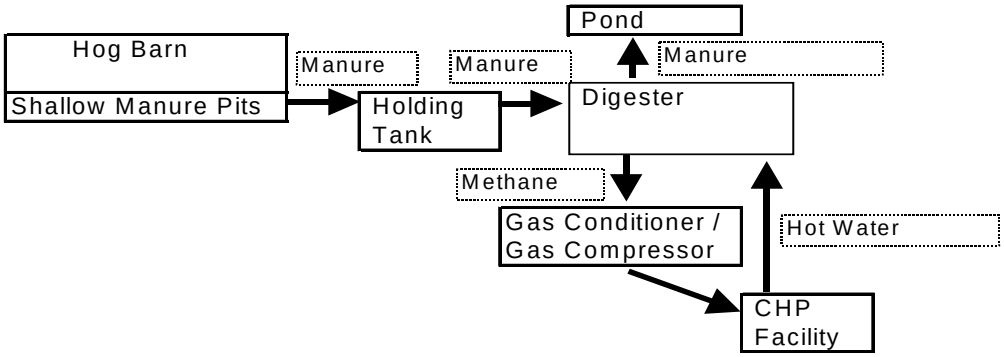
Colorado Pork is a family-owned pig farm located in Lamar, Colorado. The farm is a farrow to wean operation consisting of approximately 6,300 sows. In 1998 Colorado voters passed Amendment 14, which places stringent environmental restrictions on hog farms. Most importantly, Amendment 14 prevents hog farms from applying hog waste above agronomic rates (more waste than can be used in crops) and requires hog farms to minimize odors and avoid ground water contamination. In response, Colorado Pork decided to address these regulatory requirements by installing a combined heat and power system (CHP) that uses methane recovered from a state-of-the art hog manure digester.

The CHP system consists of a caterpillar engine (Model 3306) with an installed capacity of 80 kW that serves approximately 50 percent of the farm's peak electricity needs; the heat from the engine's jacket water and exhaust is recovered to maintain the digester's optimal operating temperature of 102º F. The farm is also interconnected with Southeast Colorado Power Association, a rural cooperative, which provides the remainder of the farm's electricity load.

In total, the engine produces approximately 43,000 kWh of electricity per month and an additional 180 MMBtu per month are recovered from engine operation to heat the digester.

Fueled by the success of the current CHP operation, Colorado Pork LLC recently added a 30 kW Capstone microturbine to the energy system. While full-year operating data is not yet available, the microturbine has been running reliably for approximately 2,000 hours.

From Manure to Energy



Hog manure is first collected in shallow manure pits below the slatted floors of the hog barns. From there the manure is moved to a holding tank on a schedule coordinated with the digester feed requirements. The digester is fed daily with up to 18,000 gallons of manure from the holding tank. In the digester approximately 61,000 cubic feet of methane are recovered per day. The methane is piped underground from the digester to a gas compressor and from there to the Caterpillar engine. Hot water recovered from the engine jacket water and exhaust heat is re-circulated through tubes in the digester to maintain the digester temperature.

Economic and Environmental Benefits

Based on the prevailing electricity rates of approximately 7.5 ¢/kWh (Southeast Colorado Power Association, Rate Schedule GD, blended demand and energy charge) and the average electricity produced by the engine generator of 43,000 kWh per month, the monthly savings amount to $3,225, or $38,700 annually. Additional savings of approximately $10,000 annually are incurred since the digester efficiently reduces manure volume, which avoids costly clean-out procedures commonly incurred by traditional open lagoon holding facilities. Also, the digester integrated with CHP results in a significant reduction in odor and reduction in methane emissions (generally considered a contributor to global warming) thereby assuring the farm's compliance with Colorado's Amendment 14 requirements.

In the near future the economics of the energy system are expected to improve even more. Negotiations are underway with Southeast Colorado Power Association to allow parallel operation of the CHP system with the utility system, with the utility purchasing excess power generated by the CHP system during off-peak hours.

For further information contact

Midwest CHP Application Center
851 S. Morgan Street
Chicago, IL 60607-7054
Phone: (312) 413-3835
Fax: (312) 996-5620
www.CHPCenterMW.org

Caterpillar Engine (left) and Capstone Microturbine (right) at Colorado Pork LLC

"The CHP system at Colorado Pork LLC has provided both economic and environmental benefits to the farm.

Encouraged by the initial success with the CHP system the energy plant recently expanded to include a microturbine generator."

Ed Lewis
Colorado Governor's Office of Energy Management and Conservation